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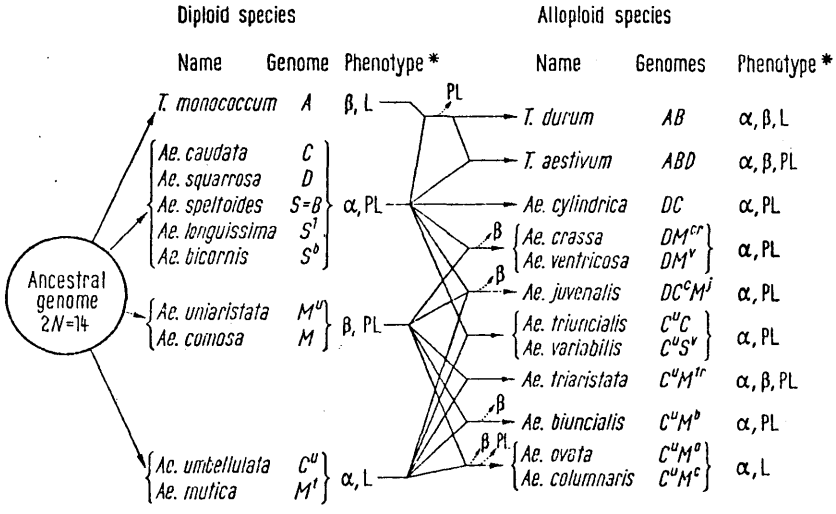
Purothionins in *Aegilops-Triticum* spp.

Purothionin was first obtained from the endosperm of hexaploid wheat (*Triticum aestivum* L.) and crystallized by BALLS et al.[1]. This high sulphur protein moiety of a proteolipid has bactericidal and fungicidal activity[2]. Recent work[3–6] has established that the crystallized material is a mixture of approximately equal amounts of 2 forms: purothionins α and β. Molecular weight determinations, aminoacid composition and other properties indicate that the 2 forms are very closely related[5]. We have found that both the allohexaploid *T. aestivum* L. (genomes *ABD*) and the allotetraploid *T. durum* Desf. (genomes *AB*) synthetize the α and β forms[6]. This note is to report some phylogenetic implications of purothionins.

The diploid species *T. monococcum* (*A*) synthetizes only the β form, suggesting that the *A* genome of *T. durum* is responsible for the genetic control of β form synthesis and the *B* genome for that of the α form. Analysis of the potential *B* genome donor, namely, the diploid species *Aegilops speltoides* (*S* = *B*), which does synthetize the α form, substantiates the hypothesis. This indicates that α and β purothionins are the result of divergent evolution at the diploid level and have come to coexist by the convergent process of alloploid formation. This points to heterogeneity within the α and β purothionins, but further characterization of purothionins from these species must wait until enough material is grown.

In alloploid species where the parental genomes have genetic information for electrophoretically different purothionins, the coexistence of the α and β forms is not always observed. A similar observation can be made with the β-sitosterol ester systems. It seems that duplicate genetic activity for similar systems represents an adaptive advantage but not necessarily a physiological one. Consequently redundant systems might be lost in the course of evolution following alloploid formation. It is to be noted that all observed losses affect the additional genomes and not the so-called pivotal genomes. This is consistent with the cytogenetical observation that pivotal genomes are completely homologous with known diploids, while the additional genomes are extensively modified and only partially homologous with diploid analyzers.

Resumen. En *Triticum durum* Desf. (genomios *AB*), el genomio *A* controla la sintesis de purotionina β y el genomio *B* la de purotionina α. Las especies diploides del grupo *Aegilops-Triticum* sintetizan α ó β, pero no las dos.



Cytogenetical relationships in *Aegilops-Triticum* species and distribution of purothionins and β-sitosterol esters systems.

We have further investigated the occurrence of α and β forms in the remaining species of the *Aegilops-Triticum* group. A micromethod was used because only small amounts of material were available. The samples, 200 to 400 mg of ground kernels were macerated for 2 h with twice the amount (v/w) of petroleum ether (b.p. 35–60°C). The supernatant was transferred with the aid of a capillary tube to a piece of paper (Whatman No. 3, 2 × 8 mm) and evaporated in the process. Lipid was dissociated from purothionin by treating the paper with 1*N* HCl in ethanol: petroleum ether (3:1) with the aid of a capillary and then was extracted by immersion in petroleum ether for 1 h. The dried paper was wet with buffer and the purothionins fractionated by starch-gel electrophoresis.

The results are summarized in the Figure. The occurrence of the previously described[7] linoleate (L) and palmitate-linoleate (PL) systems for β-sitosterol esters synthesis has been also recorded.

In diploid species, all 4 possible combinations of purothionin and sterol esters phenotypes are present. En numerosos aloploides de este grupo se observa la pérdida de la actividad sintética para la purotionina correspondiente a uno de los genomios.

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